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(54) **RETENTION ANCHOR FOR SURGICAL ACCESS DEVICES**

(57) A surgical access assembly includes a cannula and a retention anchor including an annular body and a washer secured to the annular body. The annular body includes an inner side surface defining an opening there-through, and the washer includes an inner terminal edge defining an opening therethrough that is aligned with the opening of the annular body. The elongated shaft of the cannula extends through the openings. The washer is transitionable between a first configuration in which the

inner terminal edge of the washer is coincident with or disposed radially outwardly of the inner side surface of the annular body so that the retention anchor is slidable along the elongated shaft, and a second configuration in which the inner terminal edge of the washer extends radially inwardly of the inner side surface of the annular body and engages the elongated shaft to fix the retention anchor to the elongated shaft.

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Description

FIELD

[0001] The present disclosure relates generally to surgical access devices. In particular, the present disclosure relates to a retention anchor for fixing a surgical access device in tissue.

BACKGROUND

[0002] In minimally invasive surgical procedures, including endoscopic and laparoscopic surgeries, a surgical access device permits the introduction of a variety of surgical instruments into a body cavity or opening. A surgical access device (e.g., a cannula or an access port) is introduced through an opening in tissue (e.g., a naturally occurring orifice or an incision) to provide access to an underlying surgical site in the body. The opening is typically made using an obturator having a blunt or sharp tip that may be inserted through a passageway of the surgical access device. For example, a cannula has a tube of rigid material with a thin wall construction, through which an obturator may be passed. The obturator is utilized to penetrate a body wall, such as an abdominal wall, or to introduce the surgical access device through the body wall, and is then removed to permit introduction of surgical instruments through the surgical access device to perform the surgical procedure.

[0003] Minimally invasive surgical procedures, including both endoscopic and laparoscopic procedures, permit surgery to be performed on organs, tissues, and vessels far removed from an opening within the tissue. In laparoscopic procedures, the abdominal cavity is insufflated with an insufflation gas, e.g., CO₂, to create a pneumoperitoneum thereby providing access to the underlying organs. A laparoscopic instrument is introduced through a cannula accessing the abdominal cavity to perform one or more surgical tasks. The cannula may incorporate a seal to establish a substantially fluid tight seal about the laparoscopic instrument to preserve the integrity of the pneumoperitoneum. The cannula, which is subjected to the pressurized environment, e.g., the pneumoperitoneum, may include an anchor mechanism to prevent the cannula from backing out of the opening in the abdominal wall, for example, during manipulation of the laparoscopic instrument within the cannula or withdrawal of the laparoscopic instrument therefrom.

SUMMARY

[0004] This disclosure generally relates to a retention anchor for securing a surgical access device within tissue. The retention anchor provides a counter force during insertion and/or articulation of surgical instruments through the surgical access device. In aspects in which the surgical access device includes an anchor mechanism, the retention anchor is utilized in conjunction with

the anchor mechanism to limit longitudinal movement of the surgical access device relative to the tissue (e.g., retropulsion and over-insertion) during, for example, receipt, manipulation, and/or withdrawal of surgical instruments therethrough.

[0005] The retention anchor includes an annular body and a washer affixed to the annular body that is movable relative thereto. This design increases the usability of the retention anchor by maximizing the fixation force on a surgical access device and minimizing the force required to move the retention anchor relative to the surgical access device, and makes manufacturing and assembly easier.

[0006] In one aspect, the disclosure provides a surgical access assembly including a cannula and a retention anchor. The cannula includes an elongated shaft, and the retention anchor includes an annular body and a washer secured to the annular body. The annular body includes an inner side surface defining an opening therethrough, and the washer includes an inner terminal edge defining an opening defined therethrough that is aligned with the opening of the annular body. The elongated shaft of the cannula extends through the openings of the annular body and the washer. The washer is transitionable between a first configuration in which the inner terminal edge of the washer is coincident with or disposed radially outwardly of the inner side surface of the annular body so that the retention anchor is slidable along the elongated shaft, and a second configuration in which the inner terminal edge of the washer extends radially inwardly of the inner side surface of the annular body and engages the elongated shaft to fix the retention anchor to the elongated shaft.

[0007] The inner side surface of the annular body may frictionally engage the elongated shaft of the cannula. The inner side surface of the annular body may include ridges.

[0008] The annular body may include a proximally-facing surface, and the washer may be positioned adjacent to the proximally-facing surface. The washer may include an outer terminal edge affixed to the annular body. The proximally-facing surface of the annular body may define an annular recess therein and, when the washer is in second configuration, the washer may be disposed within the annular recess.

[0009] In some aspects, when the washer is in the first configuration, the washer has a convex shape and when the washer is in the second configuration, the washer has a concave shape.

[0010] The washer may be more rigid than the annular body. The washer may be formed from a metal and the annular body may be formed from a rubber.

[0011] In another aspect, the disclosure provides a retention anchor for a surgical access device including an annular body and a washer secured to the annular body. The annular body includes an inner side surface defining an opening therethrough, and the washer includes an inner terminal edge defining an opening defined there-

through that is aligned with the opening of the annular body. The washer is transitionable between a first configuration in which the inner terminal edge of the washer is coincident with or disposed radially outwardly of the inner side surface of the annular body, and a second configuration in which the inner terminal edge of the washer extends radially inwardly of the inner side surface of the annular body.

[0012] The inner side surface of the annular body may include ridges.

[0013] The annular body may include a proximally-facing surface, and the washer may be positioned adjacent to the proximally-facing surface. The washer may include an outer terminal edge affixed to the annular body. The proximally-facing surface of the annular body may define an annular recess therein and, when the washer is in second configuration, the washer may be disposed within the annular recess.

[0014] In some aspects, when the washer is in the first configuration, the washer has a convex shape and when the washer is in the second configuration, the washer has a concave shape.

[0015] The washer may be more rigid than the annular body. The washer may be formed from a metal and the annular body may be formed from a rubber.

[0016] In yet another aspect, a method of securing a surgical access device to tissue includes: positioning an elongated shaft of a cannula within tissue; sliding a retention anchor disposed on the elongated shaft of the cannula distally until the retention anchor abuts an outer surface of the tissue, the retention anchor including an annular body having an inner surface defining an opening therethrough and a washer secured to the annular body and having an inner terminal edge defining an opening therethrough that is aligned with the opening of the annular body, the elongated shaft of the cannula extending through the openings of the annular body and the washer, the washer disposed in a first configuration in which an inner terminal edge of the washer is coincident with or disposed radially outwardly of an inner surface of the annular body so that the retention anchor is slidable along the elongated shaft; and moving the washer of the retention anchor to a second configuration in which the inner terminal edge of the washer extends radially inwardly of the inner side surface of the annular body and engages the elongated shaft to fix the retention anchor to the elongated shaft.

[0017] Moving the washer may include pressing the washer into an annular recess defined in the annular body of the retention anchor.

[0018] The method may further include expanding an expandable anchor of the cannula against an inner surface of the tissue.

[0019] The details of one or more aspects of the disclosure are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the aspects described in this disclosure will be apparent from the description and drawings, and from

the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

5 **[0020]**

FIG. 1 is a perspective view of a surgical access assembly including a cannula and a retention anchor in accordance with an aspect of the disclosure;

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FIG. 2 is a perspective view of the retention anchor of the surgical access assembly of FIG. 1;

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FIG. 3 is cross-sectional view of the surgical access assembly of FIG. 1, taken along section line 3-3 of FIG. 1, shown with the retention anchor in a first configuration;

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FIG. 4 is a cross-sectional view of the surgical access assembly of FIG. 3, shown with the retention anchor in a second configuration; and

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FIG. 5 is a side view of the surgical access assembly of FIG. 1, shown disposed within tissue.

DETAILED DESCRIPTION

[0021] Aspects of the disclosure are described hereinbelow with reference to the accompanying drawings; however, it is to be understood that the disclosed aspects are merely exemplary of the disclosure and may be embodied in various forms. Well-known functions or constructions are not described in detail to avoid obscuring the disclosure in unnecessary detail. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the disclosure in virtually any appropriately detailed structure.

[0022] Like reference numerals refer to similar or identical elements throughout the description of the figures. Throughout this description, the term "proximal" refers to a portion of a structure, or component thereof, that is closer to a user, and the term "distal" refers to a portion of the structure, or component thereof, that is farther from the user.

[0023] FIG. 1 illustrates a surgical access system 1 including a surgical access device or cannula 10 and a retention anchor 20. The cannula 10 generally includes an elongated shaft 12 supporting an instrument housing 14 on a proximal or first end portion 12a thereof and an expandable anchor 16 (e.g., an inflatable anchor, such as a balloon, or a contractable anchor, such as a collapsible flange) on a distal or second end portion 12b thereof. The expandable anchor 16 secures the cannula 10 against an inner surface of a body wall, such as an abdominal wall, as seen in FIG. 5.

[0024] The retention anchor 20 is supported on the

elongated shaft 12 of the cannula 10. The retention anchor 20 is releasably engageable with the elongated shaft 12, and slidable therealong to adjust the position of the retention anchor 20 on the elongated shaft 12. The retention anchor 20 secures the cannula 10 against an outer surface of the body wall and stabilizes the cannula 10 relative to the body wall.

[0025] Generally, the cannula 10 is employed during surgery (e.g., laparoscopic surgery) to access a surgical site and may, in various aspects, provide for the sealed insertion of surgical instruments into an insufflated body cavity, such as an abdominal cavity. The cannula 10 is usable with an obturator (not shown). The obturator generally includes an elongated body supporting a tip on a distal end thereof. The tip can have a bladed or non-bladed (e.g., blunt) penetrating distal end that can be used to incise or separate tissue of the body wall so that the cannula 10 can be introduced therethrough. The cannula 10 and the obturator may be capable of being selectively connected together. For example, the obturator may be inserted into and through the cannula 10 until a handle housing of the obturator engages, e.g., selectively locks into, the instrument housing 14 of the cannula 10. In this initial position, the cannula 10 and the obturator, which together form a trocar assembly, are employed to tunnel through a body wall, e.g., an abdominal wall, either by making a new passage through the body wall or by passing through an existing opening through the body wall. Once the trocar assembly has tunneled through the body wall, the obturator is removed, leaving the cannula 10 in place, e.g., in an incision created by the trocar assembly. The instrument housing 14 of the cannula 10 may include an insufflation port 15 that provides insufflation fluid (e.g., gases) into the body cavity, seals and/or valves (not shown) that allows surgical instrument to be inserted into the body cavity while preventing the escape of the insufflation fluid therefrom, and an anchor inflation port 17 which is in fluid communication with the expandable anchor 16 to expand and/or contract the expandable anchor 16.

[0026] For a detailed description of the structure and function of exemplary surgical access devices suitable for use with a retention anchor of the present disclosure, reference may be made to U.S. Patent Nos: 7,691,089; 8,926,508; and 10,299,778, the entire contents of each of which are hereby incorporated by reference herein.

[0027] Turning now to FIG. 2, in conjunction with FIG. 1, the retention anchor 20 includes an annular body 22 having a first or proximally-facing surface 24, a second or distally-facing surface 26, an outer side surface 28, and an inner side surface 30. The outer and inner side surfaces 28, 30 extend between and interconnect the first and second surfaces 24, 26 and respectively define outer and inner terminal edges 28a, 30a of the retention anchor 20.

[0028] The inner side surface 30 defines an opening 23 through the annular body 22 that is sized and shaped to accommodate the elongated shaft 12 of the cannula

10 in a friction fit manner. The inner side surface 30 of the annular body 22 includes ridges 32 extending into the opening 23 to enhance the grip of the annular body 22 about the elongated shaft 12 of the cannula 10 and to limit movement of the retention anchor 20 relative to the cannula 10. It should be understood that in addition to or as an alternative to the ridges 32, the inner side surface 30 of the annular body 22 may include protrusions, bumps, projections, or other textured finishes to aid in retaining the retention anchor 20 on the elongated shaft 12 of the cannula 10 while allowing movement of the annular body 22 relative to the elongated shaft 12.

[0029] As shown in FIGS. 3 and 4, the annular body 22 includes an annular recess 25 defined in the first surface 24. The annular recess 25 extends from the inner side surface 30 of the annular body 22 radially outwardly towards the outer side surface 28, but is spaced inwardly of the outer terminal edge 28a such that the annular recess 25 extends across a majority of the first surface 24 (e.g., across more than about 50% of the surface area of the first surface 24 and, in some aspects, across more than 75% of the surface area of the first surface 24). The annular recess 25 is sized and shaped to retain a washer 34 therein.

[0030] The washer 34 is a thin, flat annular disk including an inner terminal edge 34a defining an opening 35 therethrough, and an outer terminal edge 34b. The opening 35 is aligned with the opening 23 defined through the annular body 22 to accommodate the elongated shaft 12 of the cannula 10 therethrough. The washer 34 is positioned adjacent to the first surface 24 of the annular body 22 and is transitionable between a first or clearance configuration having a convex shape, as seen in FIG. 3, and a second or interference configuration having a concave shape, as seen in FIG. 4.

[0031] The annular body 22 of the retention anchor 20 is formed from a flexible material, such as rubber, plastic, or other suitable polymer (e.g., elastomers). The washer 34 is formed from a material that is more rigid than the annular body 22, such as a metal (e.g., a thin sheet of metal). The washer 34 is affixed to the annular body 22 by over-molding or insert molding the annular body 22 to the washer 34 such that the outer terminal edge 34b of the washer 34 is retained within the annular body 22 to securely attach the washer 34 to the annular body 22. The washer 34 is affixed to the annular body 22 only at the outer terminal edge 34b such that the inner terminal edge 34a is movable relative to the annular body 22.

[0032] The washer 34 has an outwardly biased dome shape, as shown in FIG. 3, with the outer terminal edge 34b of the washer 34 disposed within the annular body 22 and the inner terminal edge 34a of the washer 34 extending upwardly away from the first surface 24 of the annular body 22. In this first configuration, the washer 34 has a convex shape, and the inner terminal edge 34a of the washer 34 is coincident with or disposed radially outwardly of the inner side surface 30 of the annular body 22 so that only the annular body 22 is engaged with the

elongated shaft 12 of the cannula 10 and the retention anchor 20 is free to slide along the elongated shaft 12.

[0033] The washer 34 is transitionable to the second configuration, as shown in FIG. 4, by pressing the washer 34 towards the annular body 22. Since the outer terminal edge 34b of the washer 34 is affixed to the annular body 22, the inner terminal edge 34a of the washer 34 is moved downwardly into the annular recess 25 of the first surface 24 of the annular body 22. In this second configuration, the washer 34 has a concave shape, and the inner terminal edge 34a of the washer 34 extends radially inwardly of the inner side surface 30 of the annular body 22 and engages the elongated shaft 12 of the cannula 10 thereby fixing the retention anchor 20 to the elongated shaft 12 (e.g., locking the retention anchor 20 onto the cannula 10 by friction fit).

[0034] FIG. 5 illustrates the surgical access assembly 1 disposed within tissue "T," e.g., an abdominal wall. The retention anchor 20 is secured to the cannula 10 prior to introducing the cannula 10 into the tissue "T" (e.g., the retention anchor 20 may be pre-installed on the cannula 10 during manufacture or may be placed on the cannula 10 prior to use in the operating room). The elongated shaft 12 of the cannula 10 is received through the tissue "T" (e.g., by utilizing an obturator (not shown) to facilitate entry of the cannula 10 through the tissue "T"), and the expandable anchor 16 is inflated within a body cavity "C" to prevent the cannula 10 from being withdrawn through the tissue "T." The retention anchor 20, is disposed on the elongated body 12 of the cannula 10 in the first configuration (FIG. 3) and is slid distally along the elongated shaft 12 of the cannula 10 until the retention anchor 20 abuts or presses on the tissue "T."

[0035] The retention anchor 20 is then transitioned to the second configuration (FIG. 4) by pressing the washer 34 down into the annular recess 25 of the annular body 22 of the retention anchor 20, in the direction of arrow "A," to lock the retention anchor 20 onto the elongated shaft 12 of the cannula 10 by friction fit between the washer 34 and the elongated shaft 12. The tissue "T" is thus sandwiched between the expandable anchor 16 and the retention anchor 20 to prevent the cannula 10 from being withdrawn from or over-inserted into the tissue "T." In this manner, the surgical access assembly 1 is secured to the tissue "T" and longitudinal movement of the cannula 10 relative to the tissue "T" is prevented or minimized throughout insertion, withdrawal, and/or manipulation of a surgical instrument "S" through the cannula 10.

[0036] Following the surgical procedure, the expandable anchor 16 is deflated to permit the withdrawal of the cannula 10 from the tissue "T." The retention anchor 20 may remain secured to and disposed about the elongated shaft 12 of the cannula 10 in the second configuration during withdrawal of the cannula 10, or may be moved to the first configuration prior to removal of the cannula 10 from the tissue "T" (e.g., by applying a force against the second surface 26 of the annular body 22 towards the first surface 24 to pop the washer 34 back into the

first configuration).

[0037] While aspects of the disclosure have been shown in the drawings, it is not intended that the disclosure be limited thereto, as it is intended that the disclosure be as broad in scope as the art will allow and that the specification be read likewise. It is to be understood, therefore, that the disclosure is not limited to the precise aspects described, and that various other changes and modifications may be effected by one skilled in the art without departing from the scope or spirit of the disclosure. Therefore, the above description should not be construed as limiting, but merely as exemplifications of aspects of the disclosure. Thus, the scope of the disclosure should be determined by the appended claims and their legal equivalents, rather than by the examples given.

[0038] The invention may be described by the following numbered paragraphs:

1. A surgical access assembly comprising: a cannula including an elongated shaft; and a retention anchor disposed about the elongated shaft, the retention anchor including: an annular body including an inner side surface defining an opening therethrough; and a washer secured to the annular body, the washer including an inner terminal edge defining an opening defined therethrough that is aligned with the opening of the annular body, the elongated shaft of the cannula extending through the openings of the annular body and the washer, the washer transitionable between a first configuration in which the inner terminal edge of the washer is coincident with or disposed radially outwardly of the inner side surface of the annular body so that the retention anchor is slidable along the elongated shaft, and a second configuration in which the inner terminal edge of the washer extends radially inwardly of the inner side surface of the annular body and engages the elongated shaft to fix the retention anchor to the elongated shaft.
2. The surgical access assembly of paragraph 1, wherein the inner side surface of the annular body frictionally engages the elongated shaft of the cannula.
3. The surgical access assembly of paragraph 2, wherein the inner side surface of the annular body includes ridges.
4. The surgical access assembly of paragraph 1, wherein the annular body includes a proximally-facing surface, and the washer is positioned adjacent to the proximally-facing surface.
5. The surgical access assembly of paragraph 4, wherein the washer includes an outer terminal edge affixed to the annular body.
6. The surgical access assembly of paragraph 4,

wherein the proximally-facing surface of the annular body defines an annular recess therein and, when the washer is in second configuration, the washer is disposed within the annular recess.

7. The surgical access assembly of paragraph 1, wherein, when the washer is in the first configuration, the washer has a convex shape and when the washer is in the second configuration, the washer has a concave shape.

8. The surgical access assembly of paragraph 1, wherein the washer is more rigid than the annular body.

9. The surgical access assembly of paragraph 8, wherein the washer is formed from a metal and the annular body is formed from a rubber.

10. A retention anchor for a surgical access device, the retention anchor comprising: an annular body including an inner side surface defining an opening therethrough; and a washer secured to the annular body, the washer including an inner terminal edge defining an opening defined therethrough that is aligned with the opening of the annular body, the washer transitionable between a first configuration in which the inner terminal edge of the washer is coincident with or disposed radially outwardly of the inner side surface of the annular body, and a second configuration in which the inner terminal edge of the washer extends radially inwardly of the inner side surface of the annular body.

11. The retention anchor of paragraph 10, wherein the inner side surface of the annular body includes ridges.

12. The retention anchor of paragraph 10, wherein the annular body includes a proximally-facing surface, and the washer is positioned adjacent to the proximally-facing surface.

13. The retention anchor of paragraph 12, wherein the washer includes an outer terminal edge affixed to the annular body.

14. The retention anchor of paragraph 12, wherein the proximally-facing surface of the annular body defines an annular recess therein and, when the washer is in second configuration, the washer is disposed within the annular recess.

15. The retention anchor of paragraph 10, wherein, when the washer is in the first configuration, the washer has a convex shape and when the washer is in the second configuration, the washer has a concave shape.

16. The retention anchor of paragraph 10, wherein the washer is more rigid than the annular body.

17. The retention anchor of paragraph 16, wherein the washer is formed from a metal and the annular body is formed from a rubber.

18. A method of securing a surgical access device to tissue, comprising: positioning an elongated shaft of a cannula within tissue; sliding a retention anchor disposed on the elongated shaft of the cannula distally until the retention anchor abuts an outer surface of the tissue, the retention anchor including an annular body having an inner surface defining an opening therethrough and a washer secured to the annular body and having an inner terminal edge defining an opening therethrough that is aligned with the opening of the annular body, the elongated shaft of the cannula extending through the openings of the annular body and the washer, the washer disposed in a first configuration in which an inner terminal edge of the washer is coincident with or disposed radially outwardly of an inner surface of the annular body so that the retention anchor is slidable along the elongated shaft; and moving the washer of the retention anchor to a second configuration in which the inner terminal edge of the washer extends radially inwardly of the inner side surface of the annular body and engages the elongated shaft to fix the retention anchor to the elongated shaft.

19. The method of paragraph 18, wherein moving the washer includes pressing the washer into an annular recess defined in the annular body of the retention anchor.

20. The method of paragraph 18, further including expanding an expandable anchor of the cannula against an inner surface of the tissue.

Claims

1. A surgical access assembly comprising:

a cannula including an elongated shaft; and
a retention anchor disposed about the elongated shaft, the retention anchor including:

an annular body including an inner side surface defining an opening therethrough; and
a washer secured to the annular body, the washer including an inner terminal edge defining an opening defined therethrough that is aligned with the opening of the annular body,

the elongated shaft of the cannula extending

- through the openings of the annular body and the washer, the washer transitionable between a first configuration in which the inner terminal edge of the washer is coincident with or disposed radially outwardly of the inner side surface of the annular body so that the retention anchor is slidable along the elongated shaft, and a second configuration in which the inner terminal edge of the washer extends radially inwardly of the inner side surface of the annular body and engages the elongated shaft to fix the retention anchor to the elongated shaft.
2. The surgical access assembly of claim 1, wherein the inner side surface of the annular body frictionally engages the elongated shaft of the cannula.
 3. The surgical access assembly of claim 2, wherein the inner side surface of the annular body includes ridges.
 4. The surgical access assembly of any preceding claim, wherein the annular body includes a proximally-facing surface, and the washer is positioned adjacent to the proximally-facing surface.
 5. The surgical access assembly of claim 4, wherein the washer includes an outer terminal edge affixed to the annular body.
 6. The surgical access assembly of claim 4 or claim 5, wherein the proximally-facing surface of the annular body defines an annular recess therein and, when the washer is in second configuration, the washer is disposed within the annular recess.
 7. The surgical access assembly of any preceding claim, wherein, when the washer is in the first configuration, the washer has a convex shape and when the washer is in the second configuration, the washer has a concave shape.
 8. The surgical access assembly of any preceding claim, wherein the washer is more rigid than the annular body; preferably wherein the washer is formed from a metal and the annular body is formed from a rubber.
 9. A retention anchor for a surgical access device, the retention anchor comprising:
 - an annular body including an inner side surface defining an opening therethrough; and
 - a washer secured to the annular body, the washer including an inner terminal edge defining an opening defined therethrough that is aligned with the opening of the annular body, the washer transitionable between a first configuration in which the inner terminal edge of the washer is coincident with or disposed radially outwardly of the inner side surface of the annular body, and a second configuration in which the inner terminal edge of the washer extends radially inwardly of the inner side surface of the annular body.
 10. The retention anchor of claim 9, wherein the inner side surface of the annular body includes ridges; and/or wherein the annular body includes a proximally-facing surface, and the washer is positioned adjacent to the proximally-facing surface.
 11. The retention anchor of claim 9 or claim 10, wherein the washer includes an outer terminal edge affixed to the annular body.
 12. The retention anchor of any of claims 9 to 11, wherein the proximally-facing surface of the annular body defines an annular recess therein and, when the washer is in second configuration, the washer is disposed within the annular recess; and/or wherein, when the washer is in the first configuration, the washer has a convex shape and when the washer is in the second configuration, the washer has a concave shape.
 13. The retention anchor of any of claims 9 to 12, wherein the washer is more rigid than the annular body.
 14. The retention anchor of claim 13, wherein the washer is formed from a metal and the annular body is formed from a rubber.

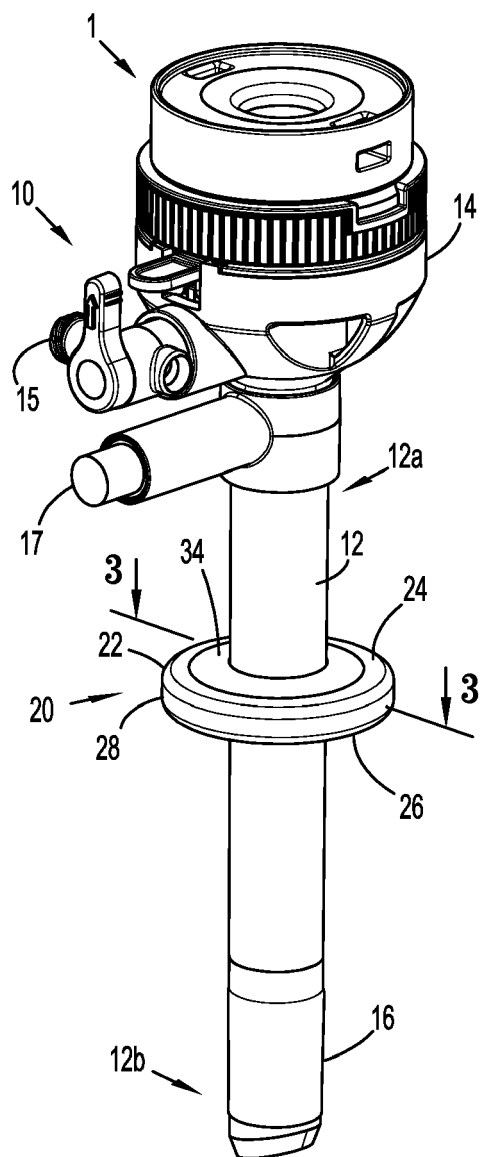


FIG. 1

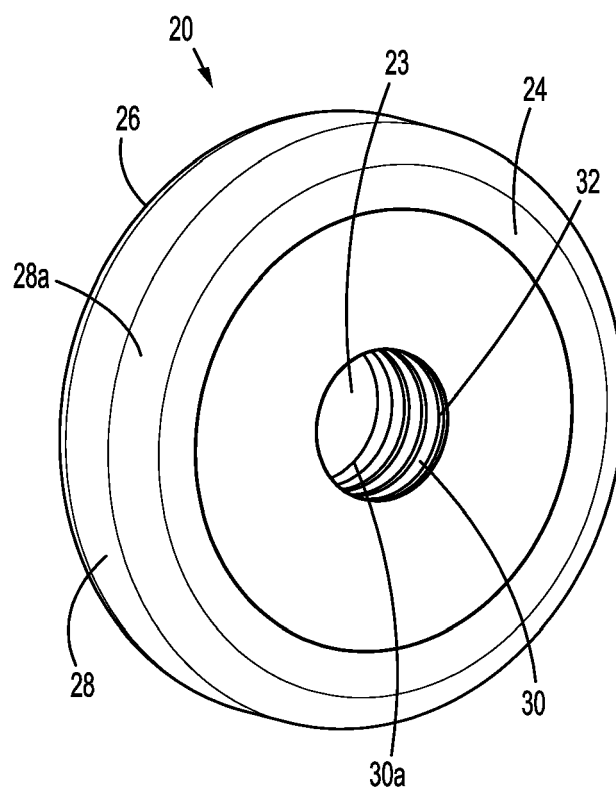


FIG. 2

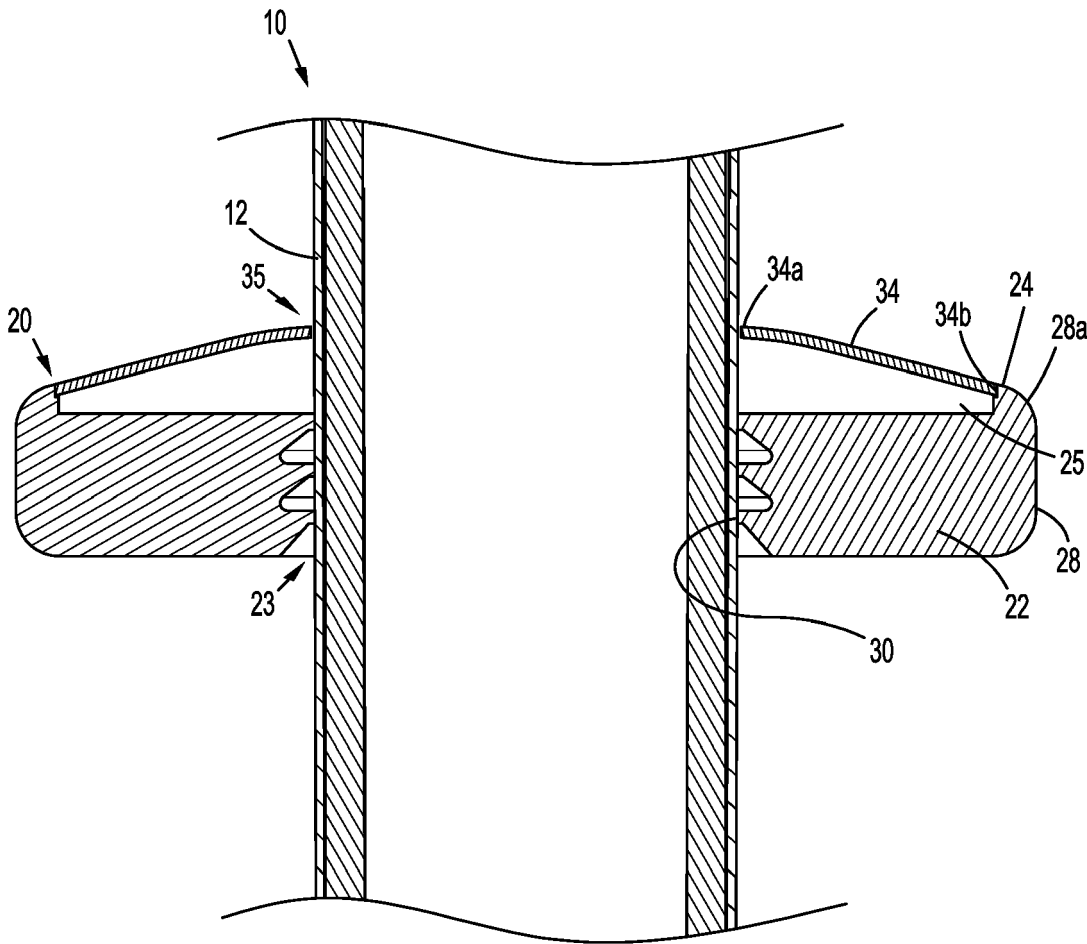


FIG. 3

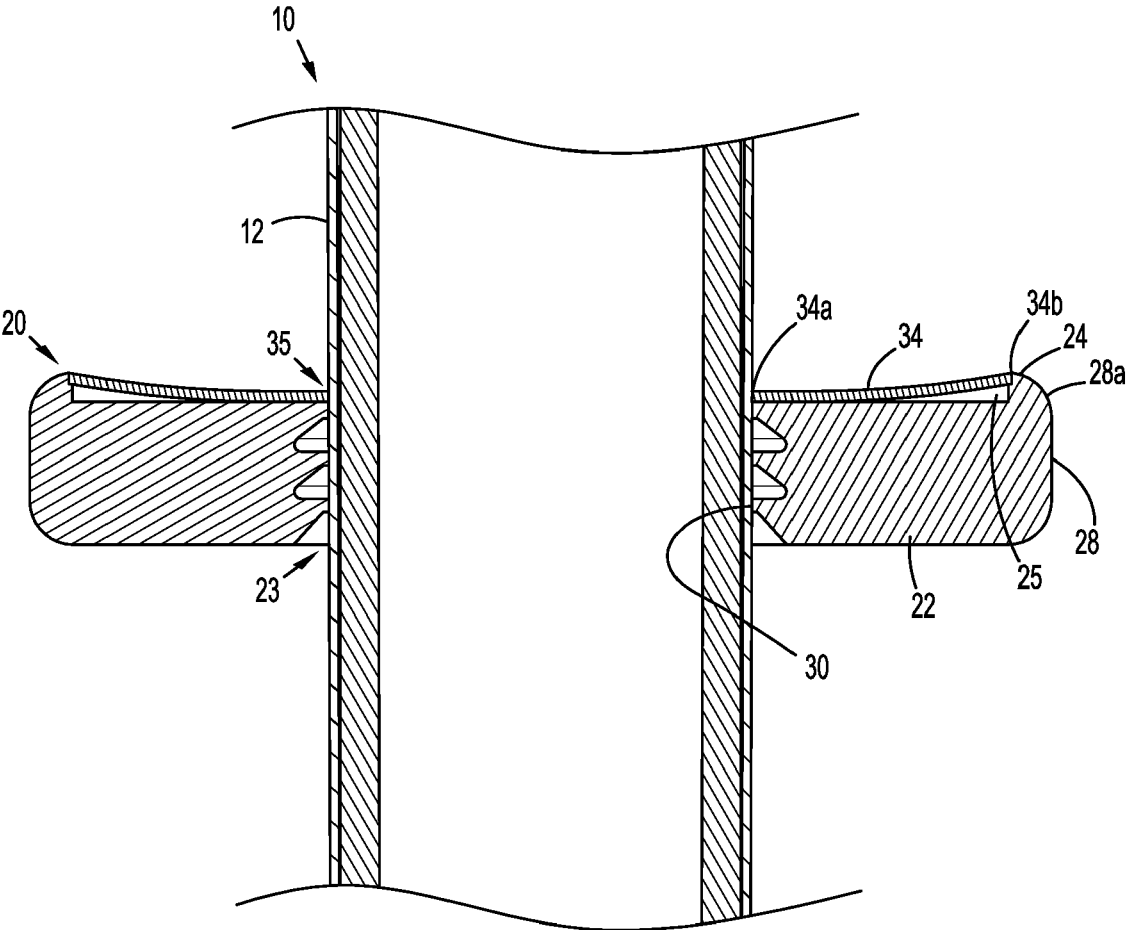


FIG. 4

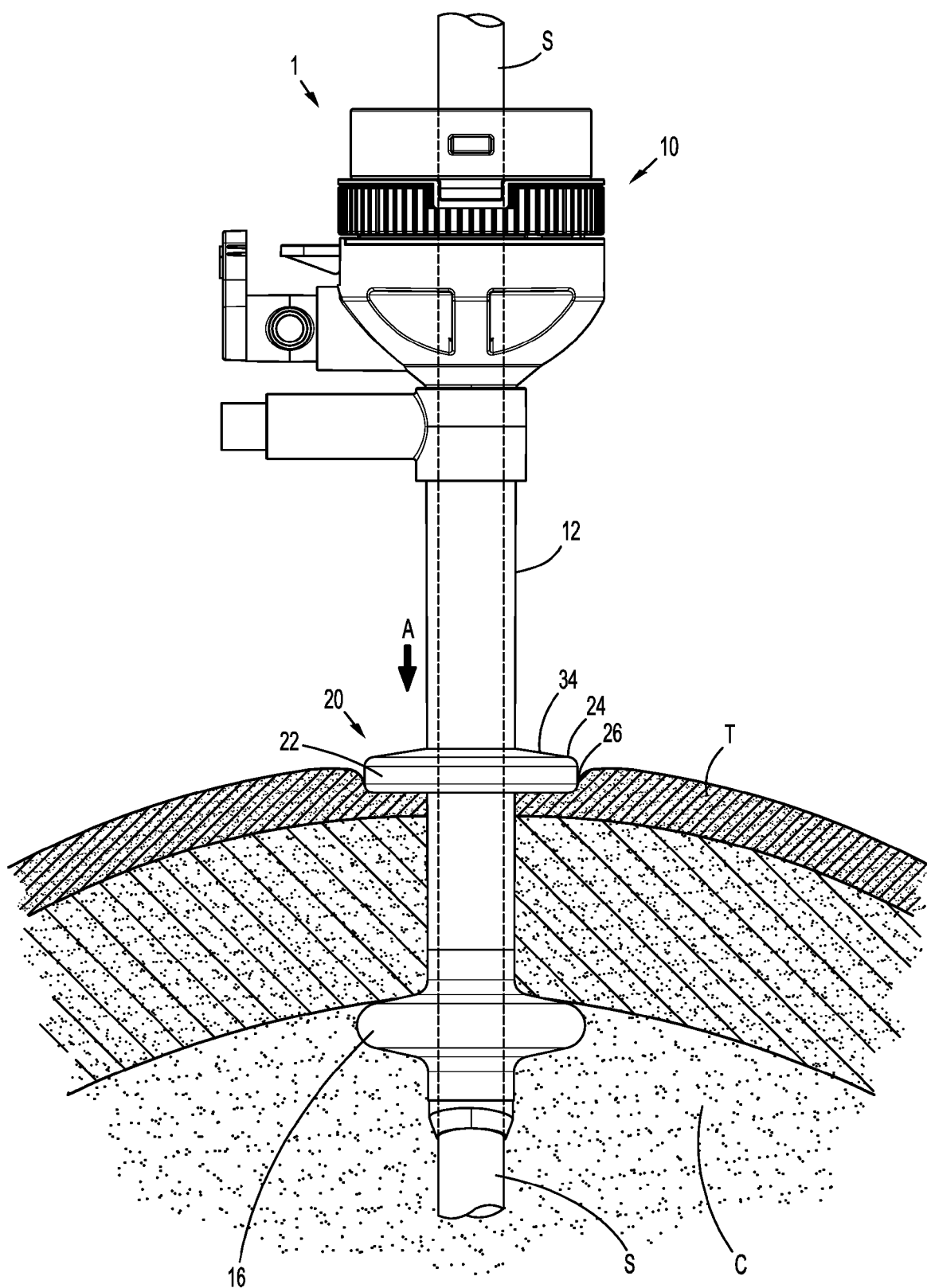


FIG. 5



EUROPEAN SEARCH REPORT

Application Number
EP 21 15 8156

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	* paragraph [0030] - paragraph [0034]; figures 5-13 *	6,7,12	
A	* paragraph [0039] - paragraph [0040] * ----- US 5 713 869 A (MOREJON ORLANDO [US]) 3 February 1998 (1998-02-03) * column 12, line 6 - line 16; figures 9a-9b *	1-14	
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A	----- US 2019/290255 A1 (PRAVONGVIENGKHAM KENNII [US] ET AL) 26 September 2019 (2019-09-26) * paragraph [0098] - paragraph [0103]; figures 21-22 *	1-14	
	-----		TECHNICAL FIELDS SEARCHED (IPC) A61B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 21 June 2021	Examiner Martinez Ramos, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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